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Title:

"Temporal changes of the botanical and functional composition of Algerian steppes of the Hadj Mechri commune ("Wilaya de Laghouat")."

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Abstract:

The Algerian steppe that covers 20 millions of hectare is one of the biggest livestock production zone in North Africa. The steppe is impacted by several global changes (climatic change, land-use changes, increase in demography, overgrazing...).

The knowledge and the dynamic of this vegetation of this steppe are essential for the different actors involved in the management of this resource. All the actors agree on the fact that the steppe productivity and area decreases. The goal of our study was to understand the dynamic of the rangeland vegetation and its resilience.

Our study site was in the Hadj Mechri commune (65.270 ha) in the Laghouat Wilaya (Algeria). The climate is semiarid (average rainfall 315mm per year, CV =31%). We made phytoecological surveys between 2007 and 2013 in the different vegetal formation defined in the beginning of the study (*Stipa tenacissima*, *Lygeum spartum* et *Stipagrostis pungens*).

We assessed the botanical composition using a NMDS based on the Bray Curtis distances between the surveys. We used the two first axes the NDMS as indicators of botanical composition. We also used the Raunkier, Noy-Meir and Grime classification to describe the vegetation. We compared these variables between the different years for each formation and all the survey together.

We notice a shift in vegetation between 2011 and 2012 on the botanical composition. This shift was also in the functional strategies of the vegetation. Between 2007 and 2011, the species were more geophytes, competitor and arido-active species than the species in 2012-2013. The species in these years were more ruderal, therophyte and arido-passive species. These shifts were more important for *Lygeum spartum*. We think that this shift were related to decrease in sand and increase in organic matter. This change was correlated with an increase of the vegetation cover and the pastoral value.

Temporal changes of the botanical and functional composition of Algerian steppes of the Hadj Mechri commune ("Wilaya of Laghouat").

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Degraded rangeland of *Stipa tenacissima L.* (2008)

INTRODUCTION

The Algerian steppe that covers 20 millions of hectare is one of the biggest livestock production zone in North Africa. The steppe is impacted by several global changes.

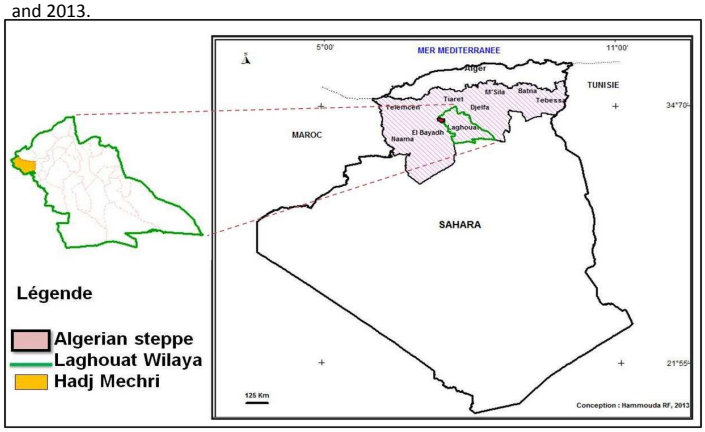
The knowledge and the dynamic of this vegetation of this steppe are essential for the different actors involved in the management of this resource. (Nedjraoui & Bedrani, 2008). The goal of our study was to understand the dynamic of the rangeland vegetation and its resilience.


Natural regeneration of *Stipa tenacissima* L. (2012)

MATERIALS AND METHODS

Our study site was the agro-pastoral commune of Hadj Mechri (65.270 ha) in the Laghouat Wilaya. The region is considered semiarid (P= 315mm year, CV =31%). The last six years were marked by a severe dryness in 2007 and 2008, followed by a very wet year in 2009, and normal rainfall patterns from 2010 to 2013.

We made 275 phyto-ecological surveys using the method of "points quadras" between 2007 and 2013.

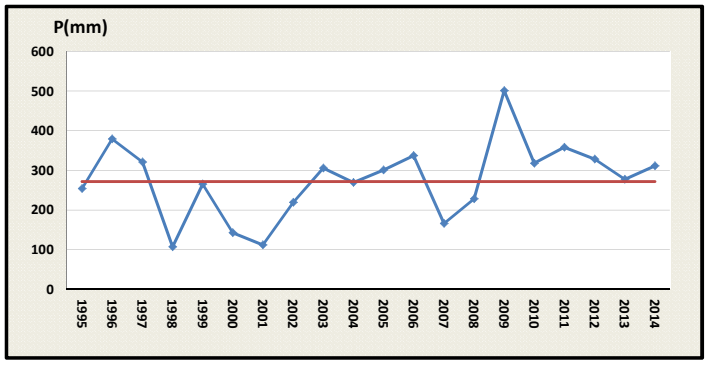


We projected the Bray Curtis dissimilarities using Nonmetric Multi-Dimensional Scaling (NMDS). We used the Raunkiaer classification (1934) and Grime strategies (1977) to describe the vegetation.

We compared these different variables between the different years using ANOVA followed by a Tukey HSD test.

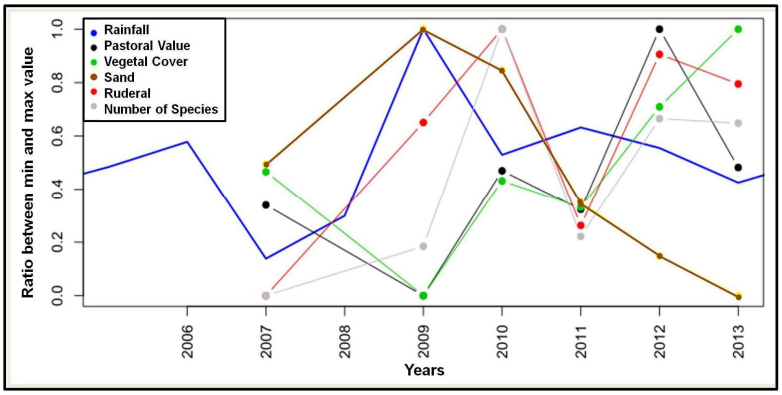
RESULTS AND DISCUSSION

The analysis of the botanical composition confirm that the surveys were made in three different vegetal formations: *Stipa tenacissima L., Lygeum spartum L. and Stipagrostis pungens Desf.*. We observe a change in botanical composition during the different years of the surveys with a shift between 2011 & 2012.
This modification is also correlated with an increase in biodiversity and a change in Raunkier groups from geophyte to therophyte.



Annual rainfall between 1995-2014

The cover of competitor species is higher in the first years of the monitoring at the opposite the cover of ruderal species increase. It is interesting to notice the time-lap between rainfall and vegetation dynamics. These shifts were more important for *Lygeum spartum L.*



Dynamic of the variables of the vegetation and the rainfall per year.

CONCLUSIONS AND IMPLICATIONS

We have showed the resilience of the steppe vegetation to a dryness event. Competitor species were more present during the dry years.
A very wet year can stimulate the functioning of the ecosystem. The competitors' species are progressively replaced by ruderal species maybe due to the impact of grazing.

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